suitable educational promise. The amount of the assistance to be granted will be limited to the actual sum deemed sufficient to meet the necessary fees and the expenses of maintenance of the candidate, after due account has been taken of his private means, if any. It is intended, however, that the amount of the assistance shall be such as will enable a candidate to take his course of training under reasonably adequate conditions. The types of training for which assistance may be granted are:—(1) Courses of higher education in institutions approved by the Board of Education or by the Board of Agriculture and Fisheries, or by the corresponding Departments for Scotland or Ireland; (2) such practical training in offices and works and professional employments as may be approved by the Ministry of Labour; and (3) such practical training on farms, etc., as may be approved by the Board of Agriculture and Fisheries, or by the corresponding Department for Scotland or Ireland. The Ministry of Pensions will co-operate in the working of the scheme on behalf of disabled officers and men, who will be eligible for assistance under the scheme, subject to compliance with the prescribed conditions. The existing provisions of the Royal Warrants as to training the disabled will remain in force, so far as they may be more beneficial to candidates than the provision made by this scheme.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 5.—Dr. J. W. L. Glaisher, vice-president, in the chair.—Dr. C. **Chree**: Electric potential gradient and atmospheric opacity at Kew Observatory. It has been the practice for many years at Kew Observatory at the ordinary hours of meteorological observation to record the most distant of a selected series of objects which is visible at the time. Separate notes are also made of the presence of mist or fog. Thus a large amount of information has accumulated as to the greater or less opacity of the atmosphere. The present paper utilises the data for a comparison of atmospheric opacity and the potential gradient of atmospheric electricity. It is found that even for the smallest amount of opacity which the observation scheme is able to disclose, the value of the potential gradient increases with the opacity. The effect of mist or fog on the potential gradients recorded in winter is great, and, there being a large diurnal variation in the incidence of mist or fog, there is consequently a noteworthy influence on the character of the diurnal variation of potential gradient.—E. **Nevill**: The value of the secular acceleration of the mean longitude of the moon. It is shown that where the observed errors of the tabular place of the moon are properly corrected for the observed errors in the values of the principal coefficients employed in Hansen's Lunar Tables, the residual errors are such as to show that the true value of the coefficient of the secular acceleration in the mean motion of the moon cannot differ sensibly from the value 6·2″ assigned to it by theory, so that it affords no evidence from observation of any tidal retardation in the rotation of the earth.—S. B. **Schryver** and Nita E. **Speer**: Investigations dealing with the state of aggregation. Part iv.: The flocculation of colloids by salts containing univalent organic ions. The theories dealing with the mechanism of the action of salts in flocculating colloids is discussed. According to one theory the adsorption of the discharging ion of the flocculating salt is the predominant action. If this is the case, it might be expected that salts which cause the greatest lowering of the surface tension of water would exert the greatest flocculating action where water is the dispersion medium. A series of salts containing organic ions was chosen, of which the normal solutions exhibit a wide range of surface tensions, and their flocculating action on a number of colloids was investigated. In general, no relationship was found to exist between this action and the surface tensions of the solutions. In one case, however (that of mastic), there was a marked parallelism. Attention is directed to the fact that two classes of suspensoid colloids might exist. The first class comprises those colloids which owe their charge to an ion of the salt from which the colloid is prepared, as, for example, the chlorine ion attached to a ferric hydroxide sol prepared by the hydrolysis of ferric chloride. The second class includes colloids in which the charge is due to a dissociated labile ion belonging to the colloid proper, held electrostatically to a less labile ion, as, for example, the mastic colloid, when a hydrogen ion (of the carboxyl radicle) is held electrostatically to a large anion. It is proposed to designate colloids of the first class *exionic*, and those of the second class *endionic*.—E. **Hatschek**: A study of the forms assumed by drops and vortices of a gelatinising liquid in various coagulating solutions. The paper describes a series of experiments in which drops of gelatin sol are allowed to fall into various solutions. Conditions can be so arranged that gelation takes place when any desired shape of the hanging drop or vortex thus produced has been attained. The result is permanent models of what are only transient forms when two liquids are employed, as in the experimental methods practised hitherto. If the solutions have a dehydrating effect on gelatin, a number of features not produced at all with liquids appear, such as radial ribs and membranes, or, generally speaking, cross-sections other than circular. The conditions can further be varied by the use of solutions, or of salts added to the gelatin sol, which leads to the production of permeable or semi-permeable membranes on the gelatin drop. By these means a further range of forms can be obtained, such as bi-concave discs of the shape of the human red blood corpuscle, hanging drops showing abnormal profiles and superficial segmentation, and vortex forms greatly modified by general shrinkage. Many of the forms obtained in these experiments show a close resemblance to those of the simpler organisms, both as regards general outline and secondary features.

Geological Society, December 4.—Mr. G. W. Lamplugh, president, in the chair.—Lt.-Col. Wheelton **Hind** and Dr. A. **Wilmore**: The Carboniferous succession of the Clitheroe province. The tectonic structure of the province consists of three dissected parallel anticlinal folds in beds of Carboniferous Limestone, Pendleside, and Millstone Grit age. Dissection has exposed the lower beds of Z, C, and S age, as the tectonic axes and beds of D, P, and Millstone Grit age occur on the flanks. The authors give the following table of Goniatite zones:—

	"Middle" Coal Measures	*Gastrioceras carbonarium*, von Buch
	Lower Coal Measures	*Gastrioceras carbonarium*, von Buch
	Upper Millstone Grit	*Gastrioceras listeri*, Martin
	Sabden Shales	*Glyphioceras diadema*, Beyrich
Zones of the Pendleside Series	Shales below Millstone Grit	
	Bowland Shales	*Glyphioceras bilingue*, Salter *Glyphioceras reticulatum*, Phillips *Glyphioceras spirale*, Phillips
		Glyphioceras striatum, Phillips
	Posidonomya becheri Shales	*Nomismoceras rotiforme*, Phillips *Prolecanites compressus*, Sowerby
	Carboniferous Limestone, D_2	*Glyphioceras crenistria*, Phillips

Linnean Society, December 5.—Sir David Prain, president, in the chair.—Prof. W. A. **Haswell**: The Exogoneæ. The author gives a detailed account of the species occurring at Port Jackson of this group of small Polychæte worms, belonging to the family

Syllidæ. After discussing the histology of the muscular gizzard, the author describes the reproductive organs, the modification of the nephridia at maturity, and the fixation of the ova on the ventral or dorsal surface of the mother, where they undergo development. One species, *Grubea pusilloides*, is described as hermaphrodite. The paper closes with an account of the early cleavage of the ovum and the later development.—C. D. **Soar**: Coloured drawings of British mites. The drawings illustrate the whole of the Hydracarina found and recorded for the British area. In all, there are 246 species, representing forty-two distinct genera. More than forty species and four genera were figured and described for the first time as British, and of these only four or five have since been recorded on the Continent.

Mathematical Society, December 12.—Mr. J. E. Campbell, president, in the chair.—G. H. **Hardy** and J. E. **Littlewood**: Applications of the method of Farey dissection in the analytic theory of numbers:—(1) A new solution of Waring's problem. (2) Proof that every large number is the sum of at most thirty-three biquadrates. (3) The Riemann hypothesis and the expression of a number as the sum of a stated number of primes.—N. M. **Shah** and B. M. **Wilson**: Numerical data connected with Goldbach's theorem.—Prof. M. **Frechet**: Integrals in abstract fields.

MANCHESTER.

Literary and Philosophical Society, November 26.—Mr. W. Thomson, president, in the chair.—Prof. H. **Lamb**: The movements of the eye. The theory of the movements of the eye, as developed by Helmholtz, includes some results of great interest to mathematicians as well as to physiologists. Unfortunately, they have scarcely become familiar to mathematicians, who have been apt to regard the whole matter as outside their province. The analytical investigations of Helmholtz are, moreover, long and intricate, and have doubtless been an obstacle to mathematicians and physiologists alike. The author had found that with the help of one or two propositions in the theory of rotation, now well known, the whole question can be treated in a simple and purely geometrical manner, without the use of a single mathematical symbol. The paper consisted of an exposition of the subject from the above point of view. By the aid of diagrams the classical theorems of Euler and Sir W. Hamilton on rotation were explained and used to illustrate Listing's law, which governs the positions of the eyeball when the gaze is directed to various parts of the field. Finally, the apparent distortion of straight lines and the theory of those lines which are *apparently* straight were considered. The eye is necessarily imperfect in these respects, and in obeying Listing's law effects a compromise, which is probably the best admissible.

DUBLIN.

Royal Irish Academy, November 30.—H. **Ryan** and P. **Ryan**: The action of nitric acid and nitrous acid on diphenylamine. The action of the oxy-acids of nitrogen on diphenylamine in carbon tetrachloride solution is similar to that which takes place between the same bodies in acetic acid solution. The products isolated in the various stages of the reaction at the ordinary temperature and at low concentrations of the interacting substances were: Diphenylnitrosoamine, 4-nitrodiphenylamine, 4-nitrodiphenylnitrosoamine, 4 : 10- and 2 : 10-dinitrodiphenylnitrosoamines, 4 : 10-, 2 : 10-, and 2 : 8-dinitrodiphenylamines, 2 : 4 : 8-trinitrodiphenylamine, and 2 : 4 : 8 : 10-tetranitrodiphenylamine.—H. **Ryan** and W. **O'Riordan**: The action of bromine on some derivatives of diphenylamine. Diphenylamine is generally estimated by converting it by means of bromine into its tetrabromo-derivative, and either weighing this or determining the amount of bromine absorbed during the reaction. The assumption that the only product formed from diphenylamine by interaction with a cold solution of bromine is tetrabromodiphenylamine is not entirely justified, inasmuch as hexabromodiphenylamine is also formed. In this connection the action of bromine on some nitro-derivatives of diphenylamine was also examined. Bromine reacted with 4-nitrodiphenylnitrosoamine, forming a dibromo-4-nitrodiphenylamine melting at 216° C., with 2 : 4-dinitrodiphenylamine giving a dibromo-2 : 4-dinitrodiphenylamine melting at 195·5° C., with 2 : 10-dinitrodiphenylamine or 2 : 10-dinitrodiphenylnitrosoamine forming a dibromodinitro-derivative melting at 185° C., and with 4 : 10-dinitrodiphenylamine or 4 : 10-dinitrodiphenylnitrosoamine yielding a dibromo-4 : 10-dinitrodiphenylamine melting at 247° C. At the ordinary temperature bromine did not react on a solution of 2 : 4 : 8 : 10-tetranitrodiphenylamine.

EDINBURGH.

Royal Society, December 2.—Dr. John Horne, president, in the chair.—Prof. J. **Stephenson** and Dr. Baini **Prashad**: The calciferous glands of earthworms. The simplest condition of these calciferous glands is that in which there occur slight segmental bulgings of the œsophageal canal, within which are a number of transverse folds of the epithelium. In many forms these bulgings become diverticula, such, for example, as in *Octochaetus barkudensis*, where the glands are large lobed sacs communicating with the œsophageal canal only by a narrow neck or "duct." The condition in Eutyphœus may be considered as having arisen from the fusion, along their edges, of a series of parallel epithelial lamellæ. In the Lumbricidæ the condition originated in a series of longitudinal lamellæ. The mode of evolution has been similar to what has happened in Eutyphœus, the inner edges of the lamellæ having fused. The epithelium of the glands is in all cases continuous with that of the œsophagus, and comparative anatomy shows that the various forms of glands are essentially due to various forms and degrees of complexity of the epithelial folds. The glands are, therefore, not mesodermal in origin, and are not merely the walls of blood-vessels, as has recently been contended.—Prof. J. **Stephenson** and H. **Ram**: The prostate glands of the earthworms of the family Megascolecidæ. Typical examples of the lobate and tubular prostates of the Megascolecidæ have been studied in detail. In both, the cells of the gland disintegrate to form the secretion, which takes the form of granules; in the functioning gland, therefore, cell outlines are largely lost. Regeneration takes place in both by the formation of discrete cells at the periphery of the gland. In the tubular form all the cells probably reach the lumen of the gland, and discharge directly into it. In the lobate form it appears that a large number of cells never reach the lumen of the intralobular ductule. Evidence of various kinds was supplied in proof of the fact that the glandular mass is in neither case an invagination from the surface, but is derived from tissues of mesoblastic origin.—Dr. A. M. **Williams**: The adsorption isotherm at low concentrations. It was shown that for very small adsorptions the adsorption law, both for gases and solutions, may be expressed in the form $\alpha=\alpha_0c$, where α is the amount adsorbed and c the equilibrium concentration. The general form of the adsorption curve for solutions was deduced from the above conclusion and found to agree with the results of different observers.—Lieut. J. **Logie**: The origin of anticyclones and depressions. In this paper importance was laid on radiation as the chief cause of the differences between cyclones and anticyclones. Cyclones are caused by the local cooling of the air, and anticyclones by heating, and not the reverse, as commonly believed. These facts were in harmony with the theory presented, which was developed in mathematical form in accordance with the ordinary gas laws. It was found that the entropy of the air would be increased in the region of origin, which, from the data as to upper-air temperatures provided by Mr. W. H. Dines, was estimated as being at a height of four to six kilometres. The effect of differing density of the air under the same pressure gradient was shown to intensify the pressure differences. The radiative effect might be obtained by the movement of air from equator to pole, by changes of diathermancy due to formation of thin haze, or by the covering of a large tract of country by cloud, and these causes were considered adequate in giving the variation of radiative effect required.

MELBOURNE.

Royal Society of Victoria, October 10.—Mr. J. A. Kershaw, president, in the chair.—W. M. **Bale**: Further notes on Australian Hydroids. Part iv. In this paper the author describes several new species from Victorian waters. *Lytocarpus urens*, Kirchenpauer, from Moreton Bay specimens, is proved to be the female form of *L. phillipsinus*, K. Notes are added regarding the specific relationships of the Australian brown Hydras, generally referred to *H. oligactis* (*H. fusca*). It is possible that they belong to other, European and American, species, which further research will determine.

SYDNEY.

Royal Society of New South Wales, October 2.—Mr. W. S. Dun, president, in the chair.—R. H. **Cambage**: Acacia seedlings. Part iv. The author described the seedlings of twelve species, and pointed out that although bipinnate leaves are the dominant form in seedlings of this genus, yet one species, *A. alata*, so far as his tests had gone, did not appear to produce a bipinnate leaf at all, but had simply pinnate leaves and phyllodes. He stated that seeds of *A. melanoxylon* and *A. penninervis* had germinated after having been in sea-water for 469 days, and of *A. farnesiana* after 1375 days.

BOOKS RECEIVED.

Mnemonic Notation for Engineering Formulæ. Report of the Science Committee of the Concrete Institute. With explanatory notes by E. F. Etchells. Pp. 116. (London: E. and F. N. Spon, Ltd.) 6*s*. net.

Life of Frederick Courtenay Selous, D.S.O. By J. E. Millais. Pp. xi+387. (London: Longmans and Co.) 21*s*. net.

The Science and Practice of Manuring. By W. Dyke. Revised and enlarged edition. Pp. iv+157. (London: The Lockwood Press.) 2*s*. net.

British Rainfall, 1917. By Dr. H. R. Mill and C. Salter. Pp. 240. (London: E. Stanford, Ltd.) 10*s*.

Modern Chemistry and Chemical Industry of Starch and Cellulose (with Reference to India). By Prof. T. C. Chaudhuri. Pp. viii+156. (Calcutta and London: Butterworth and Co.) 3.12 rupees net.

Bureau of Education, India. Progress of Education in India, 1912–17. By H. Sharp. Vol. i. Pp. vi+215. (Calcutta: Supt. Govt. Printing, India.) 3.10 rupees, or 5*s*. 6*d*.

The Next Step in Religion. By Dr. R. W. Sellars. Pp. 228. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd.) 1.50 dollars.

Wild Life of the World. By R. Lydekker. 3 vols. Vol. i., pp. xiv+472; vol. ii., pp. xii+440; vol. iii., pp. xi+457. (London: F. Warne and Co.) 4 guineas the three vols.

An Introduction to the Study of Biological Chemistry. By Prof. S. B. Schryver. Pp. 340. (London and Edinburgh: T. C. and E. C. Jack, Ltd.) 6*s*. net.

The Grasses and Grasslands of South Africa. By Prof. J. W. Bews. Pp. vi+161. (Pietermaritzburg: P. Davis and Sons, Ltd.) 7*s*. 6*d*. net.

Tables of Refractive Indices. Vol. i.: Essential Oils. Compiled by R. Kanthack. Edited by Dr. J. N. Goldsmith. Pp. 148. (London: Adam Hilger, Ltd.) 15*s*. net.

DIARY OF SOCIETIES.

THURSDAY, DECEMBER 19.

CHEMICAL SOCIETY, at 8.—Prof. F. Soddy: The Conception of the Chemical Element as Enlarged by the Study of Radio-active Change.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—P. Hunter-Brown: Carbon Brushes, Considered in Relation to the Design and Operation of Electrical Machinery.

ILLUMINATING ENGINEERING SOCIETY, at 8.—*Discussion opened by the President*: Summary of Progress in Photometry, with Special Reference to War Problems.

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